

STATE OF ALASKA

Bill Sheffield, Governor

Annual Performance Report for

EVALUATION OF KITOI RAINBOW TROUT vs.
SWANSON RIVER RAINBOW TROUT

by

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ALASKA DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF SPORT FISH
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RESEARCH PROJECT SEGMENT

State: Alaska

Name: Sport Fish
Investigations
of Alaska

Project: F-9-18

Study: T-4

Study Title: KODIAK TROUT STUDIES

Job: T-4-2

Job Title: Evaluation of Kitoi
Rainbow Trout vs.
Swanson River Rainbow
Trout

Cooperator: John B. Murray

Period Covered: July 1, 1985 to June 30, 1986

ABSTRACT

Equal numbers of Swanson strain and Kitoi strain rainbow trout, *Salmo gairdneri* Richardson, were stocked in four Kodiak Lakes in 1984 and three lakes in 1985 at densities ranging from 245 to 490 fish per surface hectare. Mark and multiple recapture efforts for determining population estimates did not result in sufficient numbers of fish during October 1985 to comparatively evaluate the survival of each strain in their respective age classes. A comparison of the cumulative marked-catch and fish-size data for each lake indicated Swanson strain rainbow trout are probably superior to Kitoi strain rainbow trout for stocking Kodiak lakes. The total Age 0 and Age I unmarked catch for all lakes was comprised of 92.6 percent (n=252) and 81.8 percent (n=818) Swanson strain rainbow trout, respectively. Age 0 Swanson strain rainbow trout averaged 2.5 to 7.0 millimeters longer and 0.1 to 1.4 grams heavier than Age 0 Kitoi strain rainbow trout. Age I Swanson strain rainbow trout averaged 16.7 to 22.0 millimeters longer and 13.3 to 15.5 grams heavier than Age I Kitoi strain rainbow trout.

A fish trap operated on Lee Lake outlet between May 20 and June 15, 1985 indicated little difference in the out-migratory behavior of Swanson strain and Kitoi strain rainbow trout, as 38 (40.4 percent) and 56 (59.6 percent) fish were captured, respectively.

KEY WORDS

Swanson, Kitoi, rainbow trout, growth, survival, stocking, Kodiak, Alaska.

BACKGROUND

Kodiak area lakes have been stocked with seven strains of rainbow trout (Oregon, Washington, Montana, Karluk, Swanson, Kitoi and Talarik), one mixed strain of coho salmon (Seward, Miam, Rose Tead and Upper Station) and three strains of Arctic grayling (Tolsona, Moose and Junction). Stocking commenced in 1953 with Karluk steelhead fry and continued annually through 1959. From 1961 through 1975, the stock originated from Ennis, Montana and Winthrop, Washington; these fish were incubated and reared at the Fire Lake Hatchery near Eagle River, Alaska. The 1976 rainbow were from Green River, Oregon; they were received as eggs at Fire Lake and reared at the Kitoi Bay Hatchery on Afognak Island. In 1977 the brood was from Washington and Montana, and the 1978 and 1979 plants were from Swanson River. Trout plants in 1980 were from Talarik Creek and Swanson River and Kitoi rainbow were first stocked in 1984. Arctic grayling and coho salmon were first stocked in 1962 and have generally been stocked on an annual basis.

The steelhead fry stocking densities were as high as 31,125 fish/surface hectare (Beaver Lake, 1954); however, since 1961 trout and coho have usually been stocked at 494 fish/surface hectare with a size range of 347 kg to 5,500 kg. Grayling fry have been stocked at densities of 670 to 7,269 fish/surface hectare.

To summarize the history of fish stocking, rainbow trout, coho salmon and Arctic grayling of various strains have been planted in Kodiak waters at differential rates, sizes and times and have differentially competed with threespine stickleback, Dolly Varden, coho salmon, grayling and trout. Some plants have produced fisheries and others have failed. Generally, the steelhead and outside (Washington, Oregon and Montana) rainbow stocks produced poor to fair fisheries, while Swanson rainbow, grayling and coho have produced fair to good fisheries. In some cases, excellent fisheries from the latter stocks have developed: (1) Abercrombie Lake rainbow trout reached pan size at Age I+ with 30% survival while subject to an intense sport fishery (Murray and Van Hulle 1979); (2) Long Lake creel checks indicated good catches of pan size grayling and rainbow (personal observation 1977); and (3) Lilly Pond coho reached pansize at Age I+ with an 82% survival (Murray and Van Hulle 1973). The Kitoi rainbow trout strain is currently being evaluated.

During the late 1970's and early 1980's, very few rainbow trout fingerlings were available for lake stocking in Alaska. Only two Kodiak lakes received rainbow in 1978, and no fish were received in 1981. In addition to these shortfalls, the Swanson River rainbow trout, which are currently used for lake stocking, cannot be stocked in open lakes as these fish outmigrate. Consequently, Kitoi Lake rainbow trout were selected as an alternate brood stock source for Kodiak and the State for the following reasons:

1. Kitoi rainbow trout presumably do not outmigrate as a 3 m vertical falls on the outlet eliminates all ingress.

2. Kitoi Lake is the water source for Kitoi Hatchery, and the lake is within easy access to the hatchery.
3. Kitoi rainbow trout are native to Kodiak Island waters.
4. Kitoi rainbow trout are lake shoal and inlet spawners.
5. Kitoi rainbow trout appear resistant to infectious hematopoietic necrosis virus (IHNV).
6. Kitoi rainbow trout survive and reproduce in a lake heavily infested with threespine stickleback.

The first experimental rainbow trout spawning operation was conducted on Kitoi Lake during April and May 1981, and a total of 1,962 eggs were taken (Murray 1982). The resultant fry and additional fish from the lake have been utilized as a brood fish, and currently, approximately 250 adult rainbow trout are being held for brood stock.

The common and scientific names of fish mentioned in this report are listed in Table 1, and a map of the study area is shown in Figure 1.

RECOMMENDATIONS

1. Long Lake should be eliminated from the study, because it is difficult to access and requires a larger number of fish for stocking and marking (n=3,600).
2. Margaret Lake should be added to the study, because it has easy access, contains a fish barrier on the outlet that may be modified into a trap, and requires a small number of fish for stocking and marking (n=1,400).
3. Growth and relative survival of Kitoi strain and Swanson strain rainbow trout stocked at equal densities in Abercrombie, Lee, Lilly Pond and Margaret Lakes should be evaluated through 1988.
4. To evaluate the migratory behavior of sexually mature Swanson strain and Kitoi strain rainbow trout, fish traps should be operated on Lee Lake outlet in the spring of 1987 and 1988 and Margaret Lake outlet in the spring of 1988.

OBJECTIVES

1. To determine the growth and survival of Kitoi rainbow trout versus Swanson rainbow trout stocked at equal densities and concurrently in Abercrombie Lake, Lilly Pond, Lee Lake and Long Lake.
2. To determine the egress of Swanson and Kitoi rainbow trout stocked at equal densities and concurrently in Lee

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Arctic grayling	<i>Thymallus arcticus</i> (Pallas)	GR
Coho salmon	<i>Oncorhynchus kisutch</i> (Walbaum)	SS
Dolly Varden	<i>Salvelinus malma</i> (Walbaum)	DV
Rainbow trout	<i>Salmo gairdneri</i> Richardson	RT
Steelhead trout	<i>Salmo gairdneri</i> Richardson	SH
Threespine stickleback	<i>Gasterosteus aculeatus</i> Linnaeus	TS

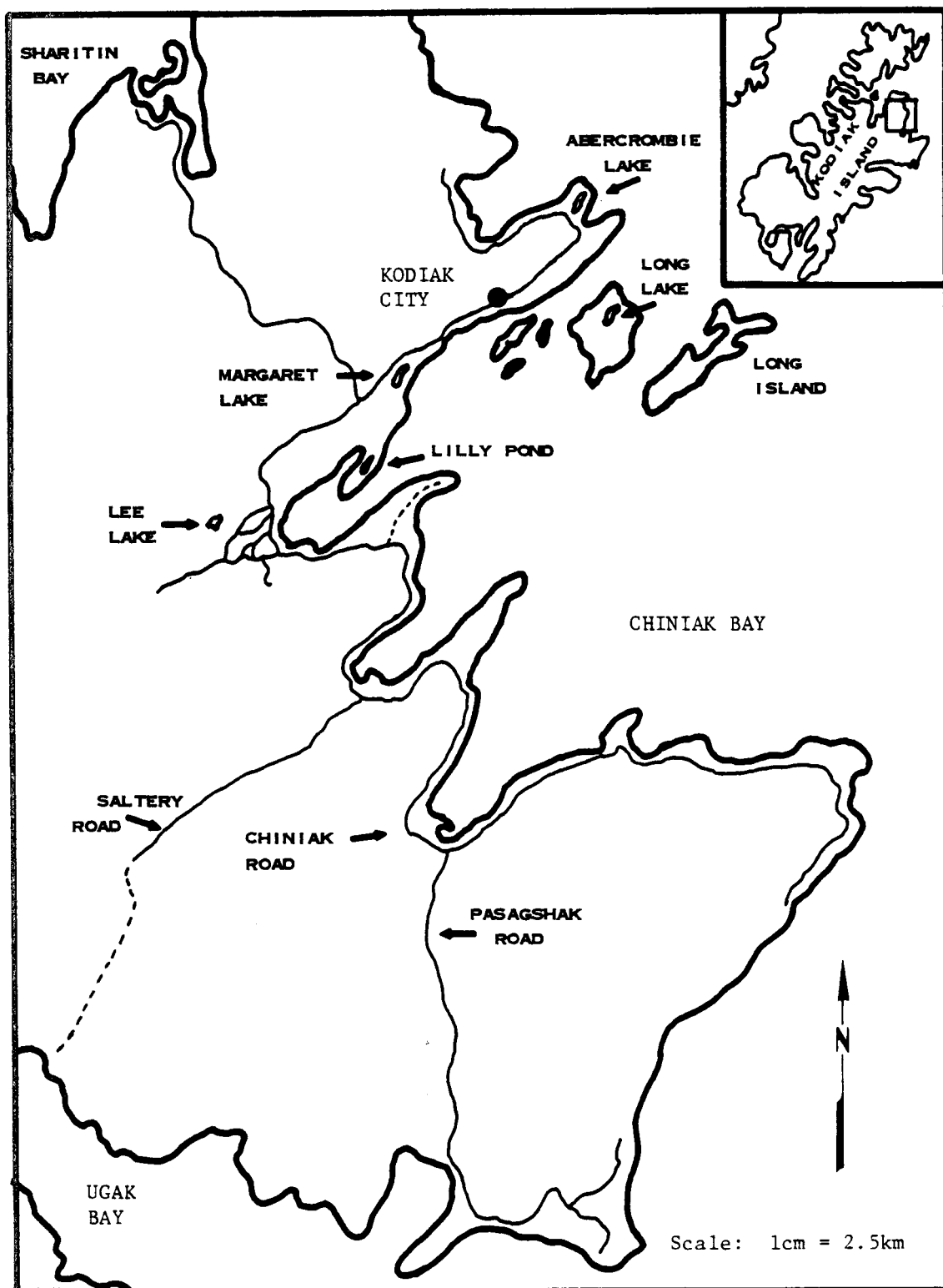


Figure 1. Kodiak Area Research Lakes, Kodiak Island, 1985.

Lake i.e., Kitoi rainbow trout are presumed non-migratory and Swanson rainbow trout are outmigrant fish.

TECHNIQUES USED

Kitoi strain rainbow trout fingerlings (\bar{x} wt=675/kg) and Swanson strain rainbow trout (\bar{x} wt=477/kg) were stocked at equal densities in Abercrombie Lake, Lilly Pond, Lee Lake and Long Lake on August 14 and 16, 1984. The above waters were stocked at the same densities on August 22 and 30, 1985, with the exception of Long Lake, which was dropped from the study. Kitoi and Swanson strain rainbow trout weighed 931 fish/kg and 1,000 fish/kg, respectively.

Kitoi rainbow trout were given a right pelvic fin clip and Swanson rainbow trout were given a left pelvic fin clip for identification purposes. Population estimates of rainbow trout at Age I were determined by Regier and Robson's (1967) mark and multiple recapture estimator. Fish were captured for sampling and marking by fyke nets of the following size: length = 3.7 m, diameter = 1.0 m, and two wings = 1.2 X 7.6 m. Two square aluminum frames and five aluminum hoops support the entrance and body of the fyke net. The wings, body and internal throats were constructed of 9.5 mm square mesh knotless nylon.

Fish were anesthetized with a 0.2% stock solution of tricaine methane-sulfonate, sampled for growth data, marked with a caudal clip, and then released in the center of the lake for dispersion.

Fish weight was determined in grams by a Lyman triple-beam balance, and fish length was measured from nose to fork of tail (FL) in millimeters on a standard fish-measuring cradle.

An existing fish barrier on the outlet of Lee Lake was modified into a fish trap for capturing outmigrant fish.

FINDINGS

Abercrombie Lake

Abercrombie Lake has been stocked annually with rainbow trout and Arctic grayling since it was chemically rehabilitated in 1972. The only exception was in 1981 when rainbow trout were not allocated for research or management purposes. On August 22 and 30, 1985, Kitoi strain ($n=1,850$, \bar{x} wt=931/kg) and Swanson strain rainbow trout ($n=1,826$, \bar{x} wt=1,000/kg) were stocked, respectively. On August 14 and 16, 1984, Kitoi strain ($n=1,850$, \bar{x} wt=675/kg) and Swanson strain rainbow trout ($n=1,800$, \bar{x} wt=477/kg) were stocked, respectively.

Five fyke nets set for 480 trap-hours on October 8 through October 12, 1985 captured 20 Age 0 (6 Kitoi, 12 Swanson and 2 unmarked fish), 332 Age I (72 Kitoi, 243 Swanson and 17 unmarked fish), and 25 older rainbow trout (Age II, III and V). Insufficient numbers of Age 0, Age I (Kitoi) and older rainbow trout were captured to compute a population estimate.

The population estimate for Age I Swanson rainbow trout (Table 2) was 478 \pm 44 fish with an estimated survival rate of 26.6%.

Age-growth data presented in the sampling summary (Table 3) indicated Age 0 Swanson rainbow trout (n=12) averaged 70.7 mm and 2.7 g, while Kitoi rainbow trout (n=6) averaged 68.2 mm and 2.6 g. Age I Swanson rainbow (n=243) were 168 mm and 48.4 g, while Age I Kitoi rainbow (n=72) were 146 mm and 32.9 g. Few Age 0 rainbow trout were captured (n=18) as many fish were small enough to escape through the fyke net webbing. Low numbers of Age I Kitoi rainbow trout (n=72) were captured as few fish were probably in the lake; e.g., at Age 0 only 84 Kitoi fish were caught in 1984 (Murray, 1985). The low catch of Age I, Age II and older rainbow is probably due to exploitation of larger fish by the sport fishery and net avoidance; i.e., Age II and older rainbow trout are difficult to fyke-net trap (Murray and Van Hulle 1981). Personal observations also indicate pan size Age I rainbow are taken in the sport fishery.

The population and size data are not conclusive for the two strains of rainbow trout at Age I as they were stocked at different sizes (Kitoi = 675/kg and Swanson = 477/kg); however, the Swanson strain appeared to have higher survival and larger growth than Kitoi rainbow. Comparable data will be gathered in 1986 for Age I fish, as both rainbow trout strains were stocked at nearly the same size and time in 1985, and these fish will all be of a sufficient size to prevent them from escaping through the fyke-net webbing.

Lee Lake

Lee Lake has been stocked almost annually with rainbow trout since it was chemically rehabilitated in 1956. The only exceptions were 1960, 1964 and 1981 when sufficient numbers of fish were not allocated for stocking. On August 14 and 16, 1984, Kitoi strain rainbow trout (n=1,400, \bar{x} wt=686/kg) and Swanson strain rainbow trout (n=1,400, \bar{x} wt=477/kg) were stocked, respectively. On August 22 and 30, 1985, Kitoi strain (n=1,400, \bar{x} wt = 931/kg) and Swanson strain rainbow trout (n=1,400, \bar{x} wt = 1000/kg) were stocked, respectively. Five fyke nets set for 240 trap-hours on October 22 through October 24, 1985 captured 32 Age 0 Swanson rainbow, 2 Age 0 Kitoi rainbow and 1 Dolly Varden. Insufficient numbers of fish were captured to compute a population estimate.

The extremely low catch is attributed to the low water temperatures (-0.1° C) and severe ice conditions that occurred during fyke trapping. The unseasonably heavy freezing limited the trapping to only 2 days, and the traps had to be chopped out of the ice on October 24, 1985.

A fish trap operated on the outlet stream of Lee lake between April 20 and June 15, 1985 captured 38 Age I Swanson rainbow trout (\bar{x} ln = 93 mm, \bar{x} wt = 11.6 g), 56 Age I Kitoi rainbow trout (\bar{x} ln = 88 mm, \bar{x} wt = 3.8 g), 24 Age I rainbow trout without marks, and 8 Age III rainbow trout. All Age III fish (2 females and 6 males) were sexually mature and in spawning condition. The fish outmigration commenced May 20 and ended May 29.

Table 2. Population Estimates of Age 0 (Swanson Strain and Kitoi Strain) Abercrombie Lake Rainbow Trout From a Sequence of Four Samples, October 8 through October 12, 1985.

Sample	Catch	Experimental Results				Summary Statistics		Estimates	
		Marked Recaptures	Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured		
								N	±S.E. (N)
<u>Age 0 Swanson Strain Rainbow Trout (LV Clipped):</u>									
1	3	0	0	3	3	3	6	No Estimate	
2	1	0	0	1	1	4	0	Insufficient	
3	4	0	0	4	4	8	0	Data	
4	4	0	0	4	4	12	0		
<u>Age 0 Kitoi Strain Rainbow Trout (RV Clipped):</u>									
1	0	0	0	0	0	0	0	No Estimate	
2	2	0	0	2	2	2	0	Insufficient	
3	1	0	0	1	1	3	0	Data	
4	3	0	0	3	3	6	0		
<u>Age I Swanson Strain Rainbow Trout (LV Clipped):</u>									
1	49	0	0	49	49	49	0	0	0
2	88	9	0	88	79	128	0	479	137
3	103	32	0	103	71	199	0	424	50
4	69	25	0	69	44	243	0	478	44
<u>Age I Kitoi Strain Rainbow Trout (RV Clipped):</u>									
1	11	0	0	11	11	11	0	0	0
2	10	0	0	10	10	21	0	0.1 E37	0.1 E19
3	26	3	0	23	23	44	0	No Estimate*	
4	30	2	0	28	28	72	0	No Estimate	

* Iterative solution not found after 100 iterations for sampling period No. 3.

Table 3. Sampling Summary of Abercrombie Lake, Lee Lake, Lilly Pond and Long Lake, 1985.

Water Name and Location	Date Sampled	Species	Number* Sampled	Age	Length (mm)		Weight (g)		Population Estimate		Percent Survival	Date Stocked	Number Stocked	Number of Fish	
					x	±S.D.	x	±S.D.	Number	±S.E.				Per kg	Per ha
Abercrombie T27S,R19W Sec.15	10/09	RT(S,LV)	12	0	70.7	5.0	2.7	0.9	NE	...	...	8/30/85	1,826	1,000	241
	thru	RT(K,RV)	6	0	68.2	6.7	2.6	0.8	NE	...	...	8/22/85	1,850	931	244
	10/12	RT(NC)	2	0	83.5	4.9	5.0	1.4	NE	...	...	Natural Reproduction or Regenerated Fins			
		RT(S,LV)	243	I	167.6	19.5	48.4	18.8	478	44	26.6	8/16/84	1,800	477	238
		RT(K,RV)	72	I	145.6	15.9	32.9	10.9	NE	...	...	8/14/84	1,850	675	244
		RT(NC)	17	I	166.9	18.8	47.7	19.0	NE	...	...	Natural Reproduction or Regenerated Fins			
		RT(S)	7	II	230.4	54.0	149.6	57.8	NE	...	...	8/22/83	3,700	871	489
		RT(S)	16	III	265.1	46.8	183.1	66.4	NE	...	...	8/01/82	3,700	972	489
		RT(S)	2	V	275.5	12.0	243.5	57.3	NE	...	...	8/25/80	3,695	1,005	488
		GR	6	IV	305.2	21.9	305.7	43.1	NE	...	...	6/12/81	20,300	Fry	2,682
Lee Lake T28S,R21W Sec.36	10/22	RT(S,LV)	32	0	76.5	5.5	4.1	1.4	NE	...	...	8/30/85	1,400	1,000	247
	thru	RT(K,RV)	2	0	69.5	6.4	3.0	1.4	NE	...	...	8/22/85	1,400	931	247
	10/24	DV	1	...	269.0	...	198.0	...	NE	...	...	Natural Reproduction or Regenerated Clip			
Lilly Pond T28S,R20W Sec.27	10/14	RT(S,LV)	208	0	77.8	5.3	4.3	1.2	542	32	54.2	8/30/85	788	1,000	390
	thru	RT(K,RV)	12	0	72.1	4.0	2.9	0.8	NE	...	...	8/22/85	800	931	396
	10/22	RT(NC)	2	0	76.5	9.2	4.0	2.8	NE	...	...	Natural Reproduction or Regenerated Clip			
		RT(S,LV)	166	I	202.4	24.6	82.9	29.5	NE	...	...	8/16/84	800	477	396
		RT(K,RV)	38	I	186.8	21.6	69.6	23.3	NE	...	...	8/14/84	800	675	396
		RT(S)	5	II	234.8	31.7	169.2	25.0	NE	...	...	8/22/83	1,600	871	792
		RT(S)	14	III	286.1	33.8	237.7	95.0	NE	...	...	8/02/82	1,600	972	792

Table 3. (Cont.) Sampling Summary of Abercrombie Lake, Lee Lake, Lilly Pond and Long Lake, 1985.

Water Name and Location	Date Sampled	Species	Number* Sampled	Age	Length(mm)		Weight (g)		Population Estimate		Percent Survival	Date Stocked	Number Stocked	Number of Fish	
					x	±S.D.	x	±S.D.	Number	±S.E.				Per kg	Per ha
Long Lake T28S,R19W Sec.14	9/30	RT(S,LV)	203	0	82.4	5.7	4.8	1.4	1,600	237	44.4	8/17/85	3,600	499	246
	thru														
	10/4	RT(S,LV)	168	I	164.7	24.5	44.3	20.0	372	38	20.4	8/16/84	1,825	477	125
	&	RT(K,RV)	64	I	143.0	19.0	30.2	14.7				8/14/84	1,800	675	123
	10/7	RT(S)	33	II	284.4	25.7	231.9	60.4	NE	...	...	8/22/83	4,056	871	278
		RT(S)	19	III	318.2	23.7	341.6	62.0	NE	...	...	8/02/82	3,600	972	246
		DV	39	...	177.7	49.3	63.0	44.0	NE	...	...	Natural Reproduction			

* Fish captured by fyke trap

RT = Rainbow Trout	LV = Left Ventral Clip
GR = Arctic Grayling	RV = Right Ventral Clip
DV = Dolly Varden	NC = No Clip
S = Swanson Strain	NE = No Estimate
K = Kitoi Strain	

Age-growth data presented in the sampling summary (Table 3) indicate Age 0 Swanson (n=32) and Kitoi (n=2) rainbow trout averaged 76.5 mm and 4.1 g, and 69.5 mm and 3.0 g, respectively.

Although the population and size data are not conclusive for both strains of rainbow trout, it appears that Swanson rainbow trout grow slightly faster than Kitoi to Age I. The outmigration of 94 Age I fish is insignificant compared to 2,800 fingerlings stocked; however, 59.6% of the marked outmigrants were Kitoi fish, suggesting little difference in the outmigratory behavior of Age I Kitoi and Swanson in Lee Lake. When these fish mature and seek spawning areas, a substantial difference in the outmigration of each strain may occur.

Lilly Pond

Lilly Pond has been stocked annually with rainbow trout or coho salmon since it was chemically rehabilitated in 1970. The only exception was in 1981 when rainbow trout were not allocated for stocking. On August 14 and 16, 1984, Kitoi strain (n=800, \bar{x} wt = 675/kg) and Swanson strain rainbow trout (n=800, \bar{x} wt = 477/kg) were stocked, respectively. On August 22 and 30, 1985, Kitoi strain (n=800, \bar{x} wt = 931/kg) and Swanson strain rainbow trout (n=788, \bar{x} wt = 1000/kg) were stocked, respectively. Five fyke traps set for 600 net-hours between October 14 and 22, 1985 captured 345 Age 0 (9 Kitoi strain, 334 Swanson strain, and 2 unmarked), 499 Age I (50 Kitoi strain and 449 Swanson strain), and 19 Age II and older rainbow trout. Insufficient numbers of Age 0 (Kitoi strain), Age I and older rainbow trout were captured to compute a population estimate. The population estimate for Age 0 Swanson rainbow trout presented in Table 4 was 542 ± 32 fish with an estimated survival rate of 54.2%.

Age-growth data presented in the sampling summary (Table 3) indicated Age 0 Swanson rainbow trout (n=208) averaged 77.8 mm and 4.3 g, while Kitoi rainbow trout (n=12) averaged 72.1 mm and 2.9 g. Age I Swanson rainbow (n=166) were 202.4 mm and 82.9 g, while Age I Kitoi rainbow (n=38) were 186.8 mm and 69.6 g. Few Age 0 Kitoi rainbow trout were captured as they probably grew slower than Age 0 Swanson fish and consequently were small enough to escape through the fyke-net webbing. Although a population estimate was not obtained for Age I rainbow trout, the cumulative unmarked catch presented in Table 4 indicates the Kitoi strain (n=50) probably had a much lower survival rate than Swanson strain (n=449) rainbow trout.

Long Lake

Long Lake has been stocked annually with rainbow trout and periodically with Arctic grayling since it was chemically rehabilitated in 1973. Rainbow trout were not stocked in 1981 as Kodiak was not allocated fish for stocking. On August 14 and 16, 1984 Kitoi strain (n=1,800, \bar{x} wt = 675/kg) and Swanson strain rainbow trout (n=1,825, \bar{x} wt = 477/kg) were stocked, respectively. On August 17, 1985 only Swanson strain rainbow trout (n=3,600, \bar{x} wt = 499/kg) were stocked. Five fyke nets set from September 30 through October 4 and again on October 7, (a total of 470 trap-hours) captured 364 Age 0, 263 Age I (189 Swanson strain and

Table 4. Population Estimates of Age 0 (Swanson Strain and Kitoi Strain) and Age I (Swanson Strain and Kitoi Strain) Lilly Pond Rainbow Trout from a Sequence of Six Samples, October 14 through October 22, 1985.

Experimental Results						Summary Statistics		Estimates	
Sample	Catch	Marked Recaptures	Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured	N	±S.E. (N)
<u>Age 0 Swanson Strain Rainbow Trout (LV Clipped):</u>									
1	16	0	1	15	16	16	0	0	0
2	122	3	0	122	119	135	1	611	302
3	118	43	1	117	75	210	1	380	38
4	90	44	3	87	46	256	2	406	28
5	39	14	0	39	25	281	5	454	30
6	83	30	0	83	53	334	5	542	32
<u>Age 0 Kitoi Strain Rainbow Trout (RV Clipped):</u>									
1	2	0	0	2	2	2	0	No Estimate*	
2	3	0	0	3	3	5	0	"	"
3	1	0	0	1	1	6	0	"	"
4	1	1	0	1	0	6	0	"	"
5	0	0	0	0	0	6	0	"	"
6	4	1	0	4	3	9	0	"	"
<u>Age I Swanson Strain Rainbow Trout (LV Clipped):</u>									
1	287	0	21	266	287	287	0	0.0	0.0
2	17	0	0	17	17	304	21	No Estimate	
3	49	1	0	49	48	352	21	0.1E 37	0.1E 37
4	107	17	0	107	90	442	21	No Estimate	
5	5	1	0	5	4	446	21	No Estimate	
6	4	1	0	4	3	449	21	No Estimate	

Table 4. (Cont.) Population Estimates of Age 0 (Swanson Strain and Kitoi Strain) and Age I (Swanson Strain and Kitoi Strain) Lilly Pond Rainbow Trout from a Sequence of Six Samples, October 14 through October 22, 1985.

Experimental Results									
Sample	Catch	Marked Recaptures	Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Summary	Statistics	Estimates	
						Cumulative Un-Marked Catch	Number Previously Dead or Injured	N	±S.E. (N)
<u>Age I Kitoi Strain Rainbow Trout (RV Clipped):</u>									
1	11	0	3	8	11	11	0	0.0	0.0
2	12	0	8	4	12	23	3	0.1E 37	0.1E 19
3	7	0	0	7	7	30	11	No Estimate**	
4	19	3	0	16	16	46	11	No Estimate	
5	4	1	0	3	3	49	11	No Estimate	
6	1	0	0	1	1	50	11	No Estimate	

* Insufficient data

** Iterative solution not found after 100 iterations for sampling period No. 3.

74 Kitoi strain), and 65 Age II and older rainbow trout and numerous threespine stickleback. The population size of Age 0 and Age I (Swanson strain) rainbow trout (Table 5) was $1,600 \pm 237$ and 372 ± 38 fish, with survival rates of 44.4% and 20.4%, respectively. Insufficient numbers of Age I (Kitoi strain) and older rainbow trout were captured to compute a population estimate.

Age-growth data presented in the sampling summary (Table 3) indicated Age 0 Swanson rainbow trout ($n=203$) averaged 82.4 mm and 4.8 g. Age I Swanson ($n=168$) and Kitoi ($n=64$) rainbow trout averaged 164.7 mm and 44.3 g and 143.0 mm and 30.2 g, respectively. A relatively large number of Age 0 Swanson strain rainbow trout ($n=364$) were captured as they were stocked at a larger size (approximately 2.0 g each); they apparently grew to a sufficient size to prevent fish from escaping through the nets.

The population and size data are not conclusive for Age I Kitoi and Swanson strain rainbow trout as they were stocked at different sizes (Kitoi = 675/kg and Swanson = 477/kg). However, a comparison of the cumulative unmarked catch (Table 5) indicates the Kitoi strain ($n=74$) probably had a much lower survival rate than Swanson strain ($n=189$) rainbow trout. A comparison of the age-growth data (Table 3) indicates the Age I Swanson strain probably grew slightly faster than Kitoi rainbow trout.

DISCUSSION

The mark and multiple recapture population estimates did not adequately describe survival rates of Kitoi and Swanson strain rainbow trout as insufficient numbers of fish were captured to compute each fish population size. However, a review of the cumulative marked-catch and fish-size data (Table 6) indicates Swanson rainbow trout are probably superior to Kitoi rainbow trout for the following reasons:

1. The total Age 0 and Age I rainbow trout catch for all lakes was comprised of 92.6% ($n=252$) and 81.8% ($n=881$) Swanson strain, respectively.
2. Age 0 Swanson strain rainbow trout averaged 2.5 to 7.0 mm longer and 0.1 to 1.4 g heavier than Age 0 Kitoi strain rainbow trout.
3. Age I Swanson strain rainbow trout averaged 16.7 to 22.0 mm longer and 13.3 to 15.5 g heavier than Age I Kitoi strain rainbow trout.

ACKNOWLEDGEMENTS

I gratefully acknowledge the cooperation of the Kodiak Fisheries Rehabilitation Enhancement and Development Division for developing the Kitoi rainbow trout brood stock and resultant fingerlings.

Table 5. Population Estimates of Age 0 (Swanson Strain) and Age I (Swanson and Kitoi Strain) Long Lake Rainbow Trout From a Sequence of Five Samples, September 30 through October 4 and October 7, 1985.

Sample	Catch	Marked Recaptures	Experimental Results			Summary Statistics		Estimates	
			Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured		
								N	±S.E. (N)
<u>Age 0 Swanson Strain Rainbow Trout (No Clipped):</u>									
1	51	0	0	51	51	51	0	0	0
2	67	2	0	67	65	116	0	1708	1164
3	66	8	0	66	58	174	0	1100	322
4	82	8	1	81	74	248	0	1416	308
5	135	19	0	135	116	364	1	1600	237
<u>Age I Swanson Strain Rainbow Trout (LV Clipped):</u>									
1	78	0	0	78	78	78	0	0	0
2	37	4	0	37	33	111	0	722	332
3	36	9	0	36	27	138	0	525	127
4	37	12	0	37	25	163	0	474	79
5	56	30	0	56	26	189	0	372	38
<u>Age I Kitoi Strain Rainbow Trout (RV Clipped):</u>									
1	17	0	0	17	17	17	0	0.0	0.0
2	18	0	0	18	18	35	0	0.1E 37	0.1E 37
3	11	3	0	8	8	43	0	No Estimate*	
4	6	2	0	4	4	47	0	No Estimate	
5	34	7	0	27	27	74	0	No Estimate	

* Iterative solution not found after 100 iterations for sampling period No. 3.

Table 6. Cumulative Unmarked Catch and Size of Kitoi Strain Rainbow Trout and Swanson Rainbow Trout (Age 0 and Age I) Captured by Fyke Net Trapping During October 1985.

Lake Name	Net- Hours	Cumulative Marked Catch				Size Data			
		Kitoi*		Swanson**		Mean Length (mm)		Mean Weight (g)	
		Number	%	Number	%	Kitoi	Swanson	Kitoi	Swanson
<u>Age 0 Rainbow Trout</u>									
Abercrombie	480	6	33.3	12	66.6	68.2	70.7	2.6	2.7
Lilly Pond	600	12	5.5	208	94.5	72.1	77.8	2.9	4.3
Lee***	240	2	5.9	32	94.1	69.5	76.5	3.0	4.1
TOTAL		20	7.4	252	92.6				
<u>Age 1 Rainbow Trout</u>									
Abercrombie	480	72	22.9	243	77.1	145.6	167.6	32.9	48.4
Lilly Pond	600	50	10.0	449	90.0	186.8	203.5	69.6	82.9
Lee***	240	0	0.0	0	0.0	...	...	...	...
Long	470	74	28.1	189	71.9	143.0	164.7	30.2	44.3
TOTAL		196	18.2	881	81.8				

* Stocked at 675 fish/kg in 1984 and 931 fish/kg in 1985.

** Stocked at 477 fish/kg in 1984 and 1,000 fish/kg in 1985.

*** Trapping not completed due to lake freezeup.

Note: Abercrombie Lake and Long Lake contain threespine stickleback populations.

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